

SYNTOR **XTM**

SYSTEMS 90•STM

Pushbutton Control Head



Instruction Manual

68P81110E87-A

MODEL CHART
FOR
SYNTOR X SYSTEMS 90•S
PUSHBUTTON CONTROL HEAD
(1 THRU 8 SELECT MODES)

● = ONE ITEM SUPPLIED

* TALK-AROUND IS A MORE COMMON TERM FOR 'DIRECT' MODE

MODEL	DESCRIPTION	ITEM	DESCRIPTION
TCN1352A	CONTROL HEAD: 1-MODE	TRN4395A	CIRCUIT BOARD (1-MODE)
TCN1351A	CONTROL HEAD: 2-MODE SELECT	TRN4340A	CIRCUIT BOARD (2-MODE)
TCN1350A	CONTROL HEAD: RPTR/TALK-AROUND*	TRN4343A	CIRCUIT BOARD (5-MODE)
TLN2267A	CONTROL HEAD: 5-MODE SELECT (REQUIRES TCN1352A OR TCN1350A)	TRN4344A	CIRCUIT BOARD (8-MODE)
TLN2268A	CONTROL HEAD: 8-MODE SELECT (REQUIRES TCN1352A OR TCN1350A OR HLN1065A OR HLN1066A)	TRN4396A	HARDWARE AND ESCUTCHEON KIT
HLN1065A	CONTROL HEAD: 16-MODE SELECT (REQUIRES TLN2268A OR HLN1075A)	TRN4390A	HARDWARE AND ESCUTCHEON KIT
HLN1066A	CONTROL HEAD: 32-MODE SELECT (REQUIRES TLN2268A OR HLN1075A)	TRN4341A	HARDWARE AND ESCUTCHEON KIT
		TRN4342A	HARDWARE AND ESCUTCHEON KIT
		TRN4345A	HARDWARE AND ESCUTCHEON KIT
		TKN8096A	CABLE AND CONNECTOR KIT
		HLN4296A	CIRCUIT BOARD (16-MODE)
		HLN4298A	CIRCUIT BOARD (32-MODE)
		HLN4297A	HARDWARE AND ESCUTCHEON KIT
		HLN4299A	HARDWARE AND ESCUTCHEON KIT

EPS-30897-A



MOTOROLA INC.

Communications
Group

SYNTOR X SYSTEMS 90•S PUSHBUTTON CONTROL HEAD

1. DESCRIPTION

1.1 PUSHBUTTON CONTROL MODULE

The pushbutton control module must replace the standard *Syntor X* control head (with the rotary-type channel selector switch) for all *Syntor Systems 90•S* module applications. It can be used alone to provide the radio with volume and squelch controls as well as with one-mode or two-mode control. This module also provides the option for standard 800 MHz 'Repeater' operation or 'Direct' (mobile-to-mobile) operation. This module is compatible only with the *Syntor X* conventional radio.

1.2 PUSHBUTTON MODE SELECT MODULE

The pushbutton mode select module is used to extend the mode selection of the pushbutton control module (described above) from two modes to five, eight, sixteen, or thirty-two modes. The 'Direct' option (discussed below) provides five or eight additional operating modes, thus allowing a total of up to eight standard 'Repeater' modes and eight 'Direct' (Talk-Around) modes.

1.3 REPEATER/DIRECT OPERATION

1.3.1 In standard 800 MHz mobile systems, the mobile units communicate with one another via a repeater to achieve an extended range of communication. In this configuration, the mobile units transmit to the repeater in the 806-to-821 MHz range, while the repeater re-transmits to the receiving mobile units in the 851-to-866 MHz range.

1.3.2 In some cases, however, it is desirable to provide the mobile units with "talk-around" (Direct) capability. A mobile radio equipped with this option can, in addition to normal repeater operation, transmit directly to other mobile units in the 851-to-866 MHz band, thus bypassing the repeater.

2. OPERATING INSTRUCTIONS

2.1 TO TURN RADIO ON

2.1.1 Radio Without Talk-Around (Direct) Option

2.1.1.1 There are six types of modules without the talk-around option: (a) single-mode control module (TCN1352), (b) two-mode control module (TCN1351), (c) five-mode select module (TLN2267), (d) eight-mode select module (TLN2268), (e) 16-mode select module (HLN1065A), and (f) 32-mode select module (HLN1066A). (Refer to Figure 1.)

2.1.1.2 The radio with the single-mode module can be turned on by depressing the **On** pushbutton; the corresponding light should illuminate to indicate that the radio has been turned on. In this case, the radio operates in mode 1, which is the only mode available with the radio.

2.1.1.3 A radio with two modes can be turned on by depressing either pushbutton **Mode 1** or pushbutton **Mode 2**; this naturally depends on the communications requirements of the operator. Each of these pushbuttons is associated with a light indicator which illuminates when its pushbutton is depressed.

2.1.1.4 Radios equipped with five-mode or eight-mode select modules can be turned on by depressing the **On** pushbutton located under the **Mode 4** pushbutton (see Figure 1). Then the required mode pushbutton should be depressed to place the radio in the required mode. Verify that the corresponding indicator is lit.

2.1.1.5 Radios equipped with sixteen-mode or thirty-two mode select modules can be turned on by depressing one of the pushbuttons designated A, B, C, or D (Figure 1) to select a group of eight modes. Then the appropriate Mode pushbutton should be depressed to place the radio in the desired mode. The indicator associated with each depressed pushbutton should light.



Syntor X, Systems 90•S, Private-Line, and Digital Private-Line are trademarks of Motorola, Inc.

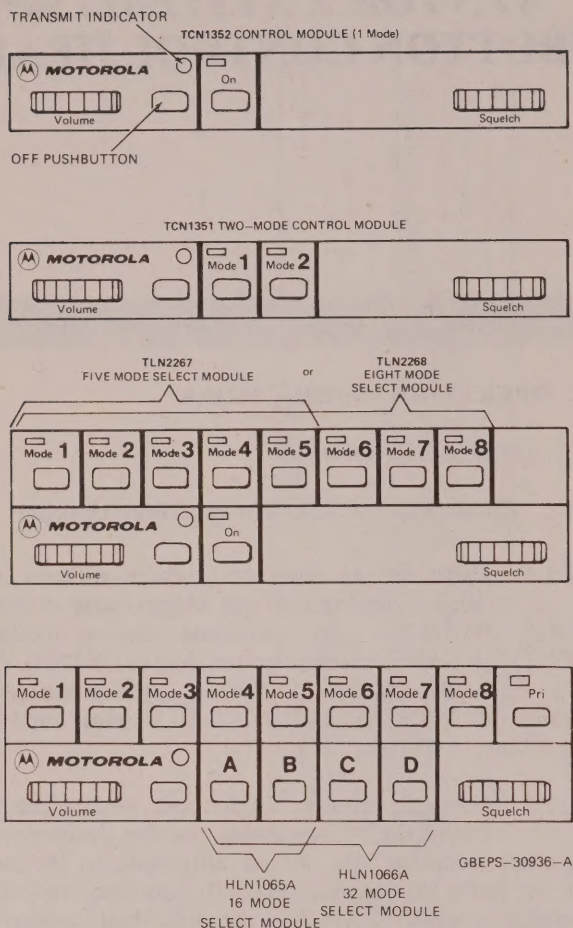


Figure 1. Operating Controls for Radios Without Talk-Around

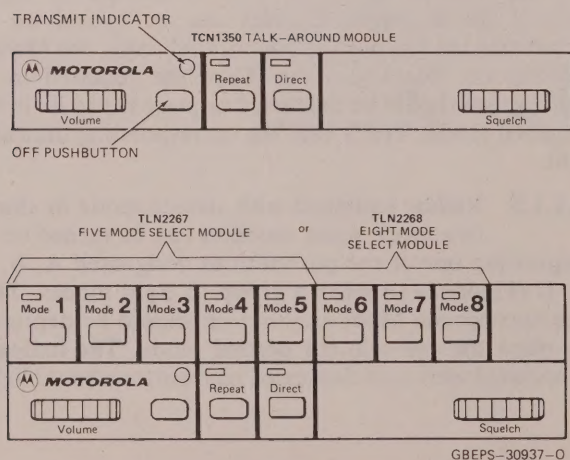


Figure 2. Operating Controls for Radios With Talk-Around

2.1.2 Radio With Talk-Around (Direct) Capability

2.1.2.1 There are three types of modules that can be equipped with the talk-around (Direct) option: (a) single mode with talk-around module (TCN1350), (b) five-mode select module (TLN2267), and (c) eight-mode select module (TLN2268).

2.1.2.2 A radio with single-mode, talk-around module can be turned on by depressing either the **Repeat** pushbutton or the **Direct** pushbutton, as required. Verify that the corresponding indicator is lit. In this case, the radio operates in mode 1, **Repeat** or **Direct**, which is the only mode available in the set.

2.1.2.3 A radio with five-mode or eight-mode select modules can be turned on by depressing either the **Repeat** or **Direct** pushbutton. The corresponding light should illuminate. This should be followed by depressing the required mode pushbutton. The proper indicator should also light.

2.3 TO RECEIVE (FOR RADIOS WITH PRIVATE-LINE OR DIGITAL PRIVATE-LINE SQUELCH)

Step 1. Set the MONITOR-OPERATE switch on the side of the hang-up switch box in the MONITOR position; this allows you to hear all the on-frequency signals.

Step 2. Turn the **Squelch** control fully toward the left.

Step 3. Turn the **Volume** control toward the right until noise is heard.

Step 4. With no signal being received, adjust the **Squelch** control by turning it slowly toward the right until the noise subsides.

Step 5. Set the MONITOR-OPERATE switch on the hang-up switch box in the OPERATE position and place the microphone in the hang-up box; this allows you to hear *Private-Line* or *Digital Private-Line* signals only.

Step 6. While listening to an incoming signal, set the **Volume** control until the desired listening level is obtained.

2.4 TO RECEIVE (FOR RADIOS WITHOUT PRIVATE-LINE OR DIGITAL PRIVATE-LINE SQUELCH)

Repeat Steps 2, 3, 4, and 6 presented above, omitting Steps 1 and 5.

2.5 TO TRANSMIT (FOR *PRIVATE-LINE*, *DIGITAL PRIVATE-LINE*, OR CARRIER SQUELCH RADIOS)

Step 1. Turn the radio on, as explained in the preceding paragraphs, and turn the ignition switch on, if desired.

NOTE

It is recommended that the engine be kept running during transmission to conserve the battery.

Step 2. Lift the microphone out of the hang-up switch box or the hang-up bracket and listen on the channel to verify that no other stations are transmitting.

Step 3. When the channel is clear, press the PTT (push-to-talk) button on the microphone and verify that the red transmit indicator (see Figures 1 and 2) is lit, indicating that the radio is transmitting a carrier.

Step 4. With the microphone about one inch from the lips, speak into the microphone in a normal or in a slightly louder-than-normal voice.

Step 5. At the end of the message, release the PTT button and place the microphone back into the hang-up switch box or bracket. (The radio receiver returns to coded or carrier squelch operation.)

2.6 TO TURN RADIO OFF

All the radio sets described in the above paragraphs (single or multi-mode, with or without talk-around) can be turned off by depressing the red pushbutton located on the right of the **Volume** control (Figures 1 and 2).

3. MAINTENANCE OF PUSHBUTTON CONTROL MODULE

3.1 INTRODUCTION

The pushbutton control module is a passive unit that has been designed for trouble-free operation. An ohmmeter is all that is required to verify proper operation of the module.

3.2 CIRCUIT CARD REMOVAL

The circuit card can be removed for troubleshooting purposes as follows:

3.2 CIRCUIT CARD REMOVAL

The circuit card can be removed for troubleshooting purposes as follows:

Step 1. Remove any plugs connected to the control module or any other circuit card in the same housing.

Step 2. Loosen the two captive screws attached to the rear housing cover and remove the rear cover.

Step 3. Remove the circuit card from the housing.

3.3 LAMP REPLACEMENT

The encapsulated lamps can be replaced by unsoldering their leads, replacing the lamp assembly, and soldering the leads of the new lamps to the circuit board.

3.4 REPAIR AND REINSTALLATION OF CIRCUIT BOARD

Other circuit board components can be replaced by following standard repair procedures. Refer to the *Syntor X FM Two-Way Mobile Radio Manual No. 68P81044E40* for information on how to order replacement parts. Once repairs are completed, the circuit board can be reinstalled as follows:

Step 1. Slide the circuit card completely into the housing.

Step 2. Reinstall the rear housing cover and tighten the two captive screws.

Step 3. Re-connect the connectors to the control module (and to any other circuit card in the same housing).

4. THEORY OF OPERATION

4.1 PUSHBUTTON CONTROL MODULE

The pushbutton control module provides the radio with the on/off functions, volume and squelch controls, and the mode and transmit indicators.

4.1.1 One-Mode Control Modules

The radio can be turned off by depressing switch S1. S1 is mechanically linked to S0, which handles the radio SW B+ current. Depressing S2 (the ON pushbutton) causes S0 to apply power to the radio, and to ground the M1 line coming from the radio, thus placing the radio set in Mode 1. At the same time, indicator DS2 turns on. R8 controls the current that flows in DS2 so that the indicator lights brightly. During transmission, the microphone PTT switch grounds one side of the transmit indicator, DS1, causing it to light brightly. R3 and R6 are the volume and squelch controls, respectively. R1 and R2 are used to lower the speaker audio level for the handset.

4.1.2 Two-Mode Control Module

The operation of this module is similar to that of the single-mode module described above, except that in this case the M2 line is connected to P1105-3. When S3

is depressed, the M2 line is grounded, indicator DS3 turns on, and the radio operates in Mode 2.

4.1.3 Repeat/Direct Control Module

The Repeat/Direct Control Module operates in a way similar to that of the two-mode control module described above, except that the M9 line is connected to P1105-3 and neither the M1 line nor the M2 line is brought to P1105. When the **Repeat** switch (S2) is depressed, no mode lines are grounded and the radio defaults to Mode 1 operation. When the **Direct** switch (S3) is depressed, the M9 line is grounded, causing the radio to operate in Mode 9. To ensure transmission on the proper frequency during direct mobile-to-mobile communication, Mode 9 is preprogrammed at the factory into the memory module of the radio. In this case, the radio must be equipped with talk-around VCO.

4.3 5- OR 8-MODE SELECT MODULE WITHOUT TALK-AROUND

4.3.1 The pushbutton control module functions in the same manner as the 1-mode module, that is, it provides the ON/OFF function, volume and squelch control, and "on" and "transmit" indications. Modes are selected by depressing a button on the mode select module to drive a dimly-lit lamp to full brilliance, indicating that a mode has been selected. This is achieved by changing the series lamp resistors (for example, R29 and R30) from a high value of 150 ohms + 56 ohms to 56 ohms by means of two contacts on the switch that has been depressed.

4.3.2 The depressed switch presents 5 V (logical 1) to one of the inputs (1 through 4 and 10 through 13) of the encoder, U3; the rest of the inputs are held at SW B- (logical 0). The switch information is encoded by U3 and presented as three bits on data lines M1, M2, and M3. These signals are inverted by the open-collector inverters U4 and U5 between the U3 output and the data lines.

4.3.3 The radio microcomputer reads lines M1 through M8 to determine which mode has been selected. When this information is presented, M7 and M8 should be at logical 0 to notify the radio that a pushbutton control head is present and that the mode selection information is in binary form. Refer to Table 1 which provides the data line information as function of the selected mode.

4.3.4 No switch information is presented to the data lines unless the CONTROL HEAD STROBE signal at J/P2-11/22 is in a high state (i.e., logical 1). This signal is buffered by Q1 and by part of U5 and is used to gate the switch information to the data lines.

4.4 5- OR 8-MODE SELECT WITH REPEAT/DIRECT

When the system includes both the Repeat and Direct modes of operation the M1 through M4 lines provide the mode information in binary form. In the standard Repeat mode, the data lines function as described in the preceding paragraph. When the Direct mode is used, the M4 data line is handled by the pushbutton control module. This module causes the M4 line to switch to a high state (logical 1) whenever the CONTROL HEAD STROBE signal is high and the rest of the mode information is present. Refer to Table 1.

4.5 16-MODE SELECT MODULE

The mode information is provided on lines M1 through M4 in binary form in the same manner as explained above for the 8-mode select module with Repeat/Direct capability. The mode information for all the 16 modes is contained in the memory module.

Table 1. Data Lines Versus Selected Modes

Data Lines	Mode Selected							
	1 RPT/DIR	2 RPT/DIR	3 RPT/DIR	4 RPT/DIR	5 RPT/DIR	6	7	8
1	0/0	1/1	0/0	1/1	0/0	1/1	0/0	1/1
2	0/0	0/0	1/1	1/1	0/0	0/0	1/1	1/1
3	0/0	0/0	0/0	0/0	1/1	1/1	1/1	1/1
4	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
5	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
6	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
7	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
8	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
HS	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

NOTE

Data lines 7 and 8 for non-rotary control heads are always grounded when HEAD STROBE is "1", indicating to the microcomputer that the mode information is in binary. Data line 4 determines whether talk-around is being requested by the control head. Data is asserted only when the HEAD STROBE signal is "1".

4.6 32-MODE SELECT MODULE

The 32-mode select module receives the mode information in binary form on data lines M1 through M5. Mode operation is similar to that of the 16-mode select module, the only exception being the use of the additional mode line (M5).

5. TROUBLESHOOTING PROCEDURE

5.1 RECOMMENDED TEST EQUIPMENT

The following test equipment will be required for troubleshooting the pushbutton control module:

- dual-trace oscilloscope, Motorola No. R1004A, or equivalent.
- digital multimeter, Motorola Model No. R1002A, or equivalent.

5.2 PROCEDURE

5.2.1 It is assumed that a radio is being used to check the operation of the control head and that the cable kit is of the appropriate type and is in good working condition.

5.2.2 If there is no power, check the green lead fuse and connections. Also look for a defective switch, S9, on the control module.

5.2.3 Check the module interconnections to locate any obvious faults such as open or short circuits. Check the lamps and switches for proper operation. When a mode is selected, its lamp should come to full brilliance. Check the switch and resistor associated with any lamp that fails this test.

NOTE

If the radio logic circuitry is suspected of being faulty, the *Syntor X* radio should first be tested against the logic and micro-computer troubleshooting chart (EEPS-30323) provided in instruction manual no. 68P81044E40 (*Syntor X* FM Two-Way Radio) to verify that the micro-computer and the interface logic circuits are providing the correct signals to the logic circuitry on the optional card.

5.2.4 If the fault has not been cleared, refer to the troubleshooting chart (EEPS-31000) provided at the end of this manual. This flowchart consists of the following procedures:

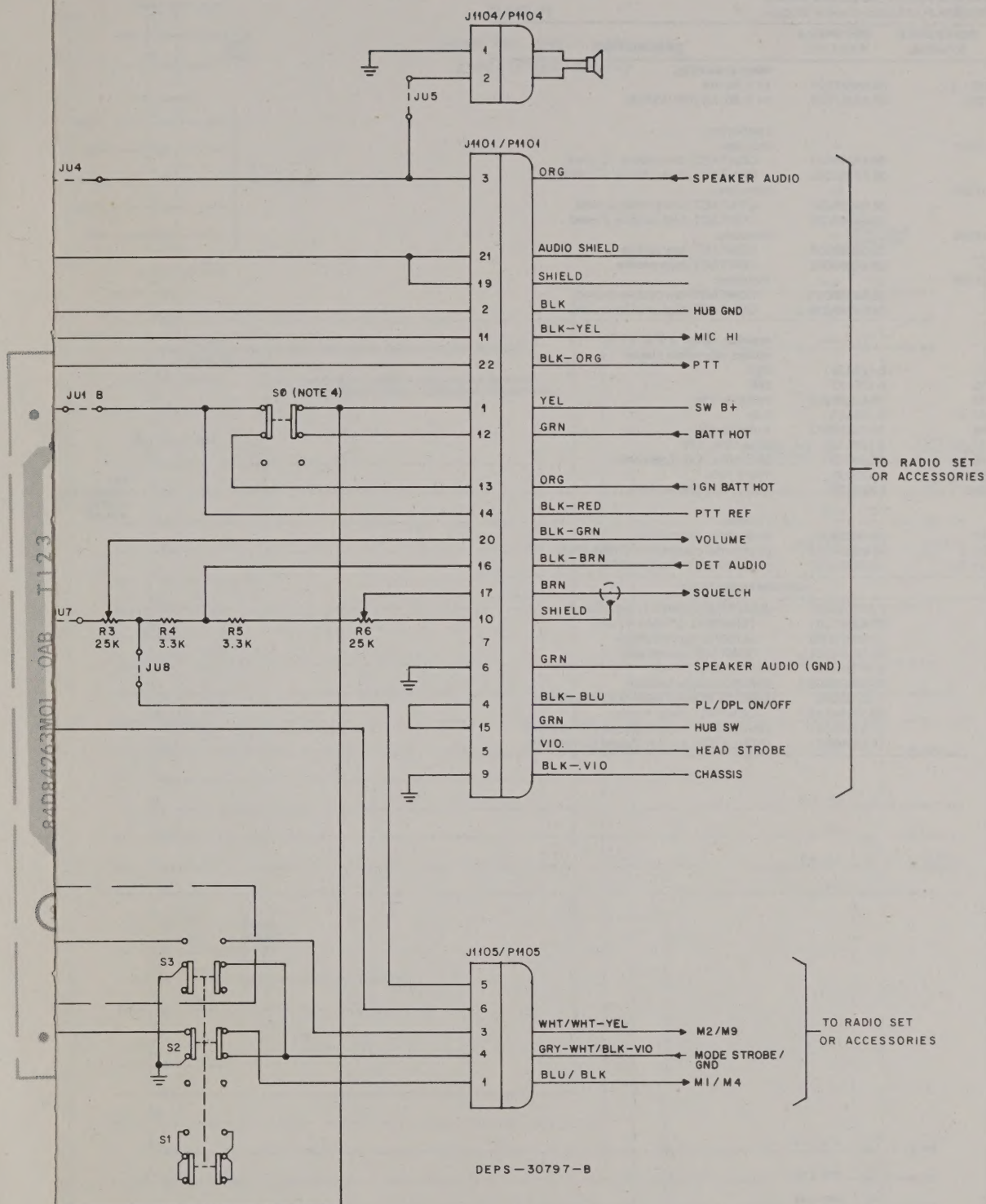
- Procedure A — for 1-mode through 8-mode standard and **Repeater/Direct** radios.
- Procedure B — for 1-mode/2-mode and **Repeater/Direct** radios.
- Procedure C — for 3-mode to 32-mode radios and for 3-mode to 8-mode **Repeater/Direct** radios.

5.2.5 The flowchart also provides two tables — Table 1 which gives the data line logic levels as function of modes, and Table 2 which gives the encoder outputs as function of the encoder inputs.

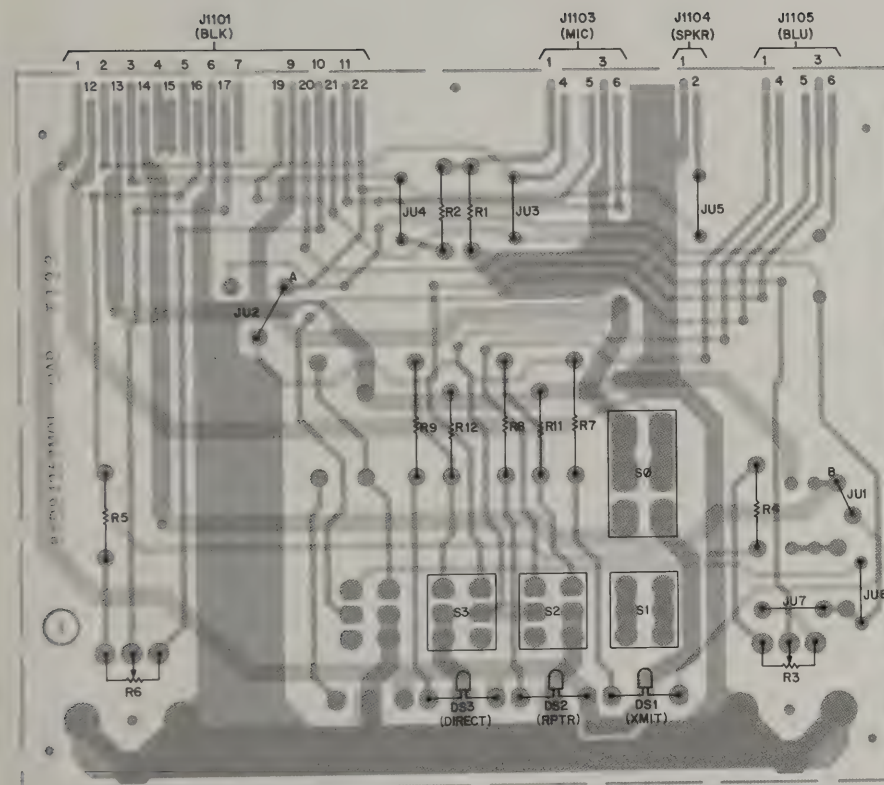
5.2.6 Reference should also be made to the timing diagram which comprises two diagrams: one for 3-mode to 8-mode radios and the other for **Repeater/Direct** radios. Also refer to the current drain table shown below.

Table 2. Current Drain Levels of Individual Modules

Module Type	Current Drain
TLN2267A 5-Mode Select	280 mA, receive
TLN2268A 8-Mode Select	400 mA, receive
TCN1352A 1-Mode Control Module	70 mA, receive
TCN1351A 2-Mode Control Module	120 mA, receive
TCN1350A REPEATER/DIRECT Module	120 mA, receive
HLN1065A 16-Mode Control Module	120 mA, receive
HLN1066A 32-Mode Control Module	220 mA, receive



TRN4340A/TRN4395A Pushbutton Control Module
Schematic Diagram, Circuit Board Detail,
Wiring Diagram, and Parts List
Motorola No. PEPS-30801-A
(Sheet 1 of 2)
12/17/81-UP



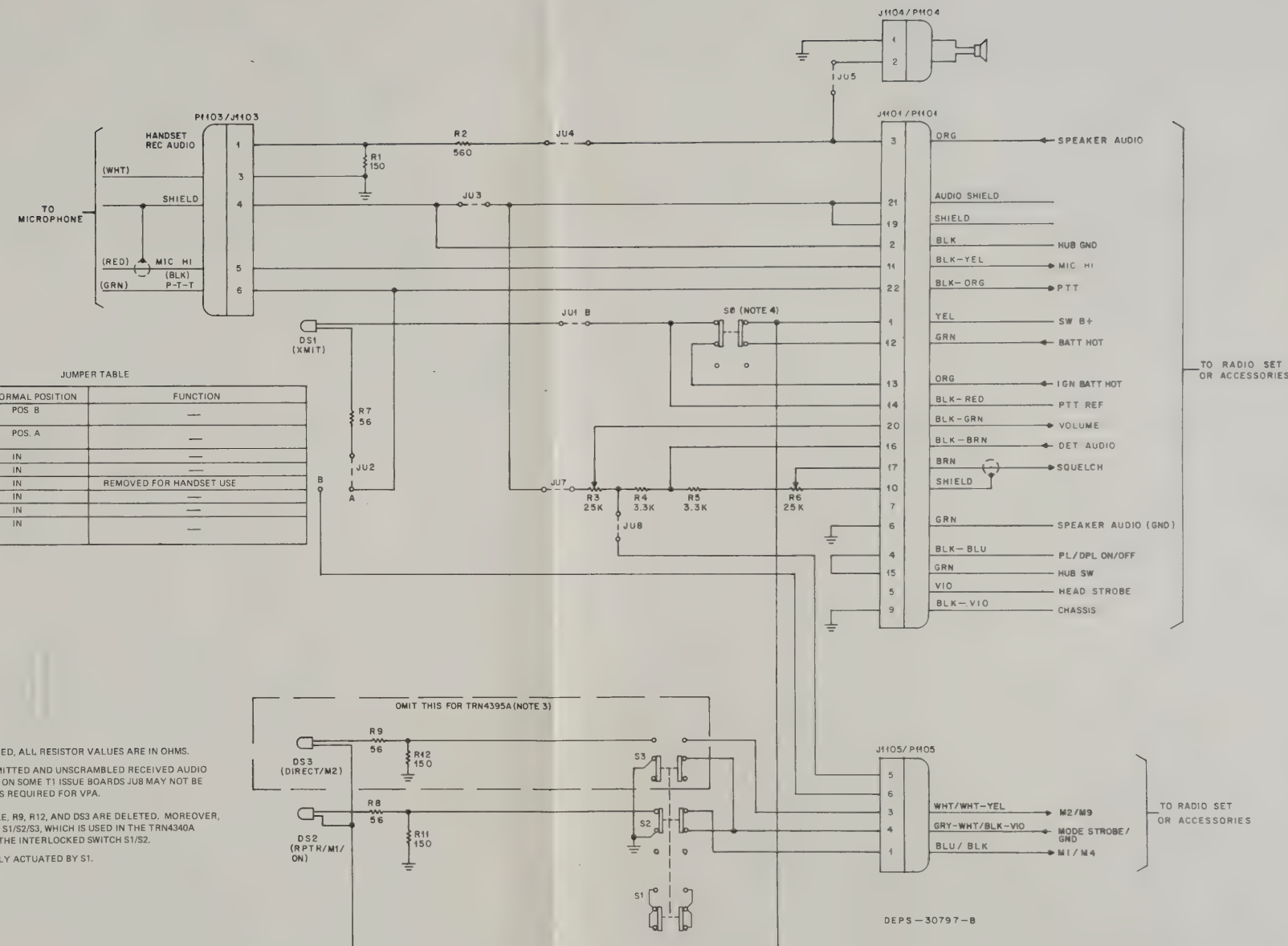
SHOWN FROM SOLDER SIDE

COMPONENT SIDE BD-CEPS-30799-0
SOLDER SIDE BD-CEPS-30798-0
OL-CEPS-30800-0

NOTE:
THE TRN4340A PUSHBUTTON CONTROL MODULE
CONTAINS ALL THE COMPONENTS SHOWN ON THE
BOARD. FOR THE TRN4395A MODULE, THE FOLLOW-
ING ARE DELETED: R9, R12 AND DS3. MOREOVER,
IT EMPLOYS INTERLOCKED SWITCHES S1/S2 RATHER
THAN INTERLOCKED SWITCHES S1/S2/S3.

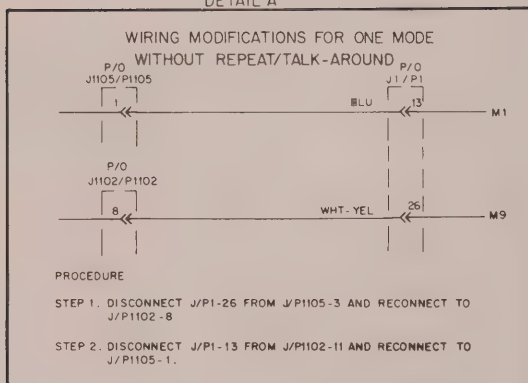
JUMPER NO.	NORMAL POSITION	FUNCTION
JU1	POS. B	—
JU2	POS. A	—
JU3	IN	—
JU4	IN	—
JU5	IN	REMOVED FOR HANDSET USE
JU6	IN	—
JU7	IN	—
JU8	IN	—

- NOTES:
- UNLESS OTHERWISE SPECIFIED, ALL RESISTOR VALUES ARE IN OHMS.
 - WHEN VPA IS USED, R4 IS OMITTED AND UNSCRAMBLED RECEIVED AUDIO IS CONNECTED TO P1105-S. ON SOME T1 ISSUE BOARDS JU8 MAY NOT BE PRESENT OR MARKED BUT IS REQUIRED FOR VPA.
 - FOR THE TRN4395A MODULE, R9, R12, AND DS3 ARE DELETED. MOREOVER, THE INTERLOCKED SWITCH S1/S2/S3, WHICH IS USED IN THE TRN4340A MODULE, IS REPLACED BY THE INTERLOCKED SWITCH S1/S2.
 - SWITCH S3 IS MECHANICALLY ACTUATED BY S1.

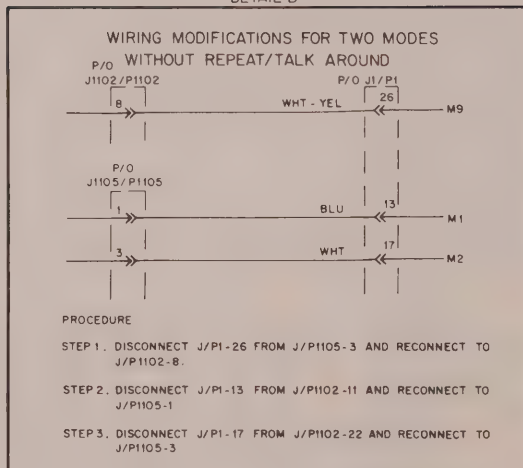


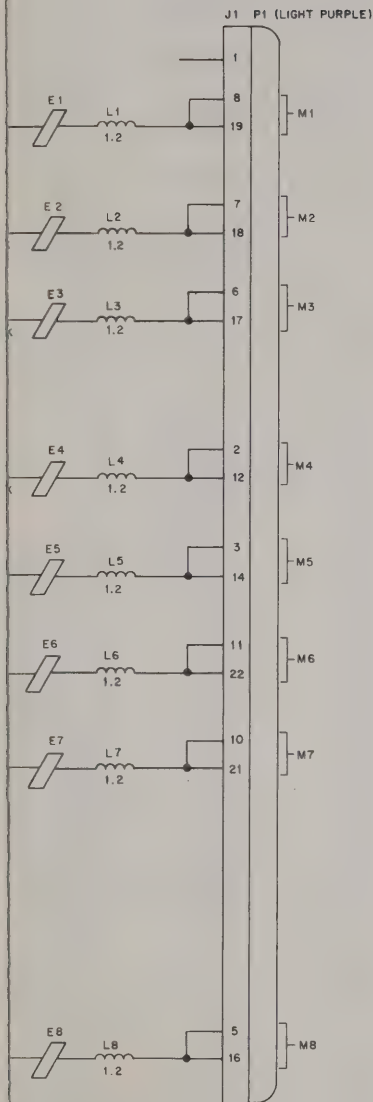
TRN4340A/TRN4395A Pushbutton Control Module
Schematic Diagram, Circuit Board Detail,
Wiring Diagram, and Parts List
Motorola No. PEPS-30801-A
(Sheet 1 of 2)
12/17/81-UP

DETAIL A



DETAIL B





ECIFIED, RESISTOR VALUES
OR VALUES IN MICROFARADS,
S IN MICROHENRIES.
ITS USED ON THIS BOARD
ECIAL CARE SHOULD BE TAKEN
E DEVICES.

NECTIONS FOR THIS BOARD

CC (PIN #)	GND (PIN #)	MFGR'S DESCRIPTION
5 V (16)	(8)	8-BIT PRIORITY ENCODER
5 V (14)	(7)	HEX INVERTER

MODE) MODULE, THE FOLLOWING
R39, R40, R41, R42, R43, R44, D56,
THIS MODULE USES 5 INTERLOCKED
ATHER THAN THE 8 INTERLOCKED
SED BY TRN4344A (8-MODE) MODULE.
ER TO THE JUMPER TABLE PRO-
IG.

E) MODULE, R28 IS 3.3K.
E) MODULE, R28 IS 1K.

JUMPER TABLE

JUMPER	NORMALLY	FUNCTION
JU1		
JU2		
JU3		
JU4	IN	TRN4343A
JU4	OUT	TRN4344A
JU5	IN	TRN4343A
JU5	OUT	TRN4344A
JU6	IN	TRN4343A
JU6	OUT	TRN4344A
JU7	IN	TRN4343A
JU7	OUT	TRN4344A
JU8	POS A	WHEN USED WITH TCN1352A, TCN1350A
JU8	POS B	WHEN USED WITH HLN1066A, HLN1066A
JU9	POS A	WHEN USED WITH TCN1352A, TCN1350A, HLN1066A
JU9	POS B	WHEN USED WITH HLN1066A
JU10	POINT A	SPECIAL CUSTOMER APPLICATION
JU11	POINT A	SPECIAL CUSTOMER APPLICATION
JU12	IN	M8 DATA LINE BUFFER INPUT
JU13	POINT A	SPECIAL CUSTOMER APPLICATION
JU14		
JU15	IN	SWITCH ENABLE SIGNAL
JU16	IN	SWITCH ENABLE SIGNAL
JU17	IN	ENCODER (U3) INPUT ENABLE
JU18	IN	DATA LINES M4 THROUGH M8 BUFFER INPUT
JU19	IN	SPECIAL CUSTOMER APPLICATION
JU20	OUT	SPECIAL CUSTOMER APPLICATION
JU21		
JU22		
JU23	IN	MODULE TROUBLESHOOTING AID

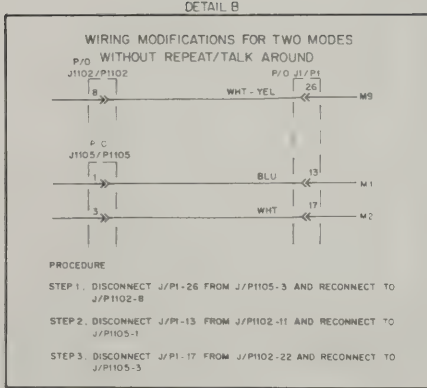
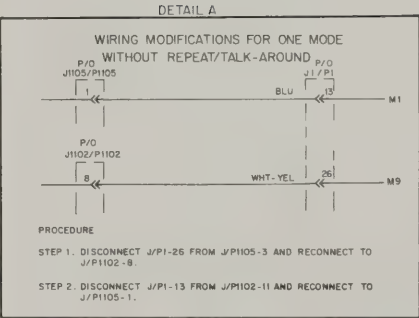
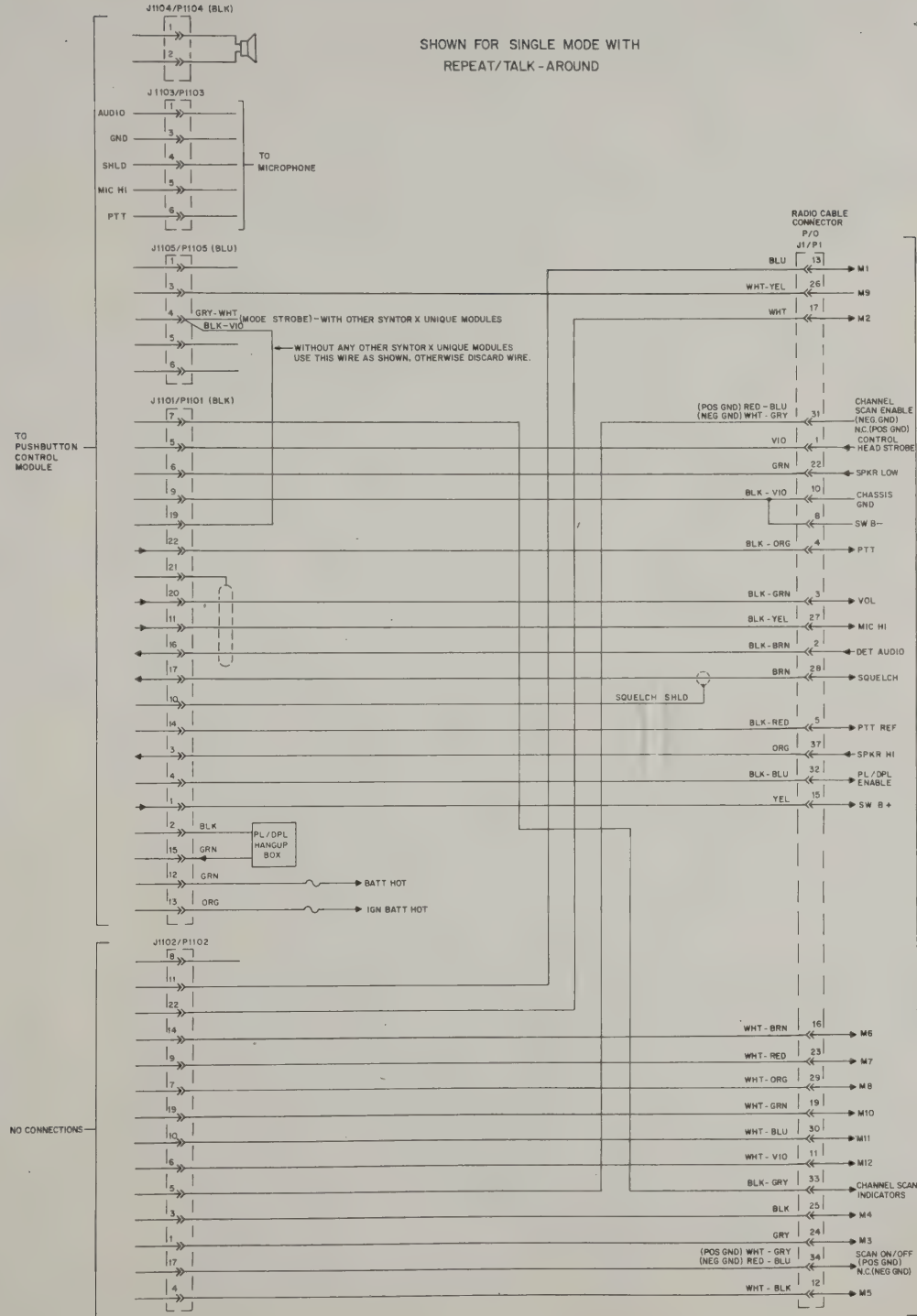
*TRN4343A/TRN4344A Mode Select Module
Schematic Diagram, Circuit Board Detail,
Wiring Diagram, and Parts List
Motorola No. PEPS-30796-A
(Sheet 1 of 2)
12/17/81- UP*

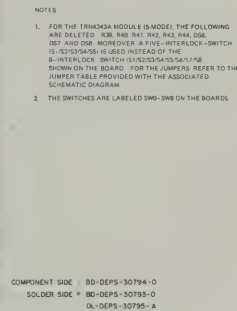
parts list

TRN4340A Pushbutton Control Module
TRN4395A Pushbutton Control Module
PL-7080-O

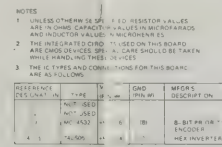
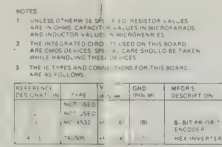
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	
DS1, 2	65-84047E01	lamp assembly: 14 V; 80 mA	
DS3	65-84047E01		14 V; 80 mA (TRN4340A)
J1101	—	connector: includes:	
J1103	28-84269C01 28-84269C02		CONTACT, low profile; 10 used CONTACT, high profile; 10 used
J1104	—	includes:	
J1105	28-84269C01 28-84269C02		CONTACT, low profile; 3 used CONTACT, high profile; 2 used
	28-84269C01 28-84269C02	includes:	
	28-84269C01 28-84269C02	CONTACT, low profile CONTACT, high profile	
	28-84269C01 28-84269C02	includes:	
	28-84269C01 28-84269C02	CONTACT, low profile; 3 used CONTACT, high profile; 2 used	
R1	6-125A29	resistor, fixed: $\pm 5\%$; 1/2 W; unless otherwise stated	
R2	6-125A43		150
R3	18-82238D23		560
R4, 5	6-125A61		variable; 25k
R6	18-82238D23		3.3k
R7, 8	6-126C19		variable; 25k
R9	6-126C19		56 $\pm 10\%$; 1 W
R11	6-125C29		56 $\pm 10\%$; 1 W (TRN4340A)
R12	6-125C29		150 $\pm 10\%$
			150 $\pm 10\%$ (TRN4340A)
S0	40-84635C01	switch: slide; dpdt, momentary	
S1, 2	40-84324C03		pushbutton; 2-position (TRN4395A)
S1, 2, 3	40-84324C39		pushbutton; 3-position (TRN4340A)
non-referenced items			
1-80728D43	JUMPER ASSEMBLY, red; 2 used		
29-83167C01	TERMINAL STRAIN RELIEF		
37-82603D60	SLEEVE, number: blank		
39-10184A24	CONTACT, receptacle		
2-10101A68	NUT, spring; 2 used		
36-84900C02	KNOB, variable resistor		
1-80726D36	CIRCUIT BOARD ASSEMBLY includes:		
39-10184A10	CONTACT, plug; 4 used		
14-84360C01	INSULATOR, switch; 3 used (TRN4340A)		
14-84360C01	INSULATOR, switch; 2 used (TRN4395A)		

TRN4340A/TRN4395A Pushbutton Control Module
Schematic Diagram, Circuit Board Detail,
Wiring Diagram, and Parts List
Motorola No. PEPS-30801-A
(Sheet 2 of 2)
12/17/81- UP



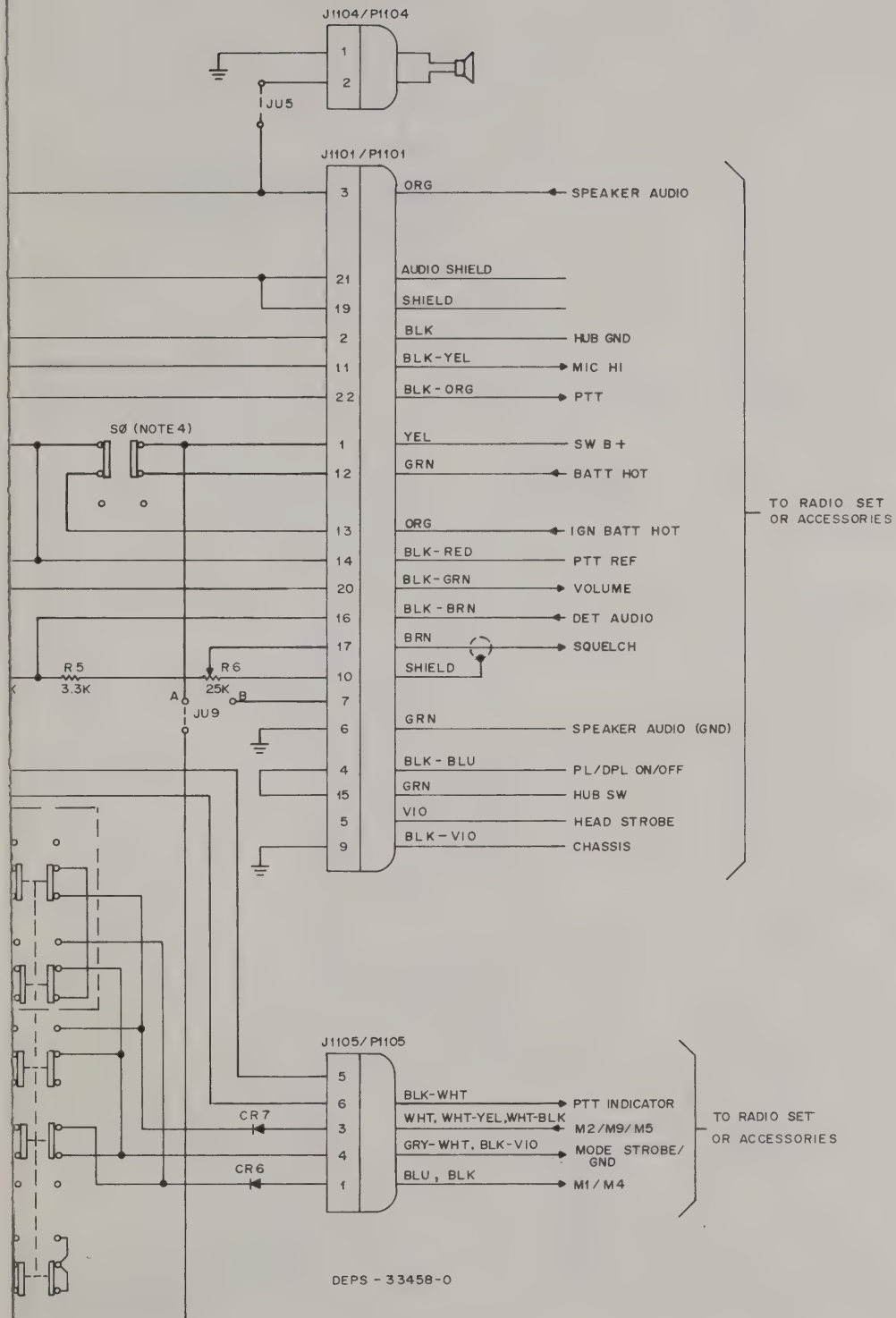


COMPONENT SIDE BD-DEPS-30794-0
SOLDER SIDE 0 BD-DEPS-30793-0
OL-DEPS-30795-A



LAMPER TABLE			
JUMPER #	MODIFIABILITY	FUNCTION	
J02			
J03			
J04	IN	TRN43A3A	ENCODER INPUT DISABLE
J06	OUT	TRN43A4A	
J05			ENCODER INPUT DISABLE
J07	OUT	TRN43A5A	
J08			ENCODER INPUT DISABLE
J09	OUT	TRN43A6A	
J10	IN		ENCODER INPUT DISABLE
J11			
J12	OUT	TRN43A7A	
J13	POS A	USED WITH TRN43A8A, TRN43A9A	
J14	POS B	WHEN USED WITH TRN43A8A, TRN43A9A	
J15	POS A	WHEN USED WITH TRN43A8A, TRN43A9A	
J16	POS B	WHEN USED WITH TRN43A8A, TRN43A9A	
J18	POINT A	SPECIAL CUSTOMER APPLICATION	
J19	POINT A	SPECIAL CUSTOMER APP., CAP. DLY.	
J20	POINT A	NO DATA LINE BUFFER INPUT	
J21	POINT A	SPECIAL CUSTOMER APPLICATION	
J22			
J23	IN	SWITCH ENABLES D.O.A.	
J24	IN	TRN43A8A3A	TRN43A8A3A
J25	IN	ENCODER (DO INPUT) ENABLE	
J26	IN	DATA LINES MAY THROUGH NO BUFFER INPUT	
J27	IN	SPECIAL CUSTOMER APPLICATION	
J28			
J29			
J30	IN	SPECIAL CUSTOMER APPLICATION	
J31			
J32	IN	MODULE TROUBLESHOOTING AID	

EEPS 30792-B



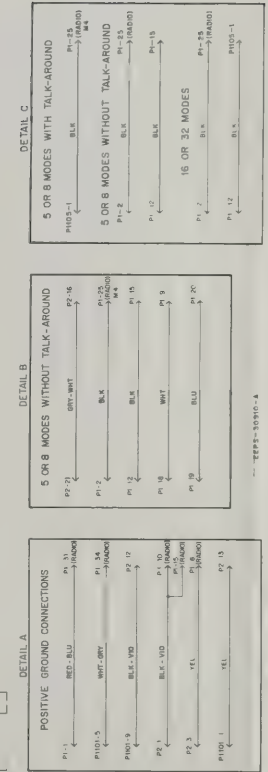
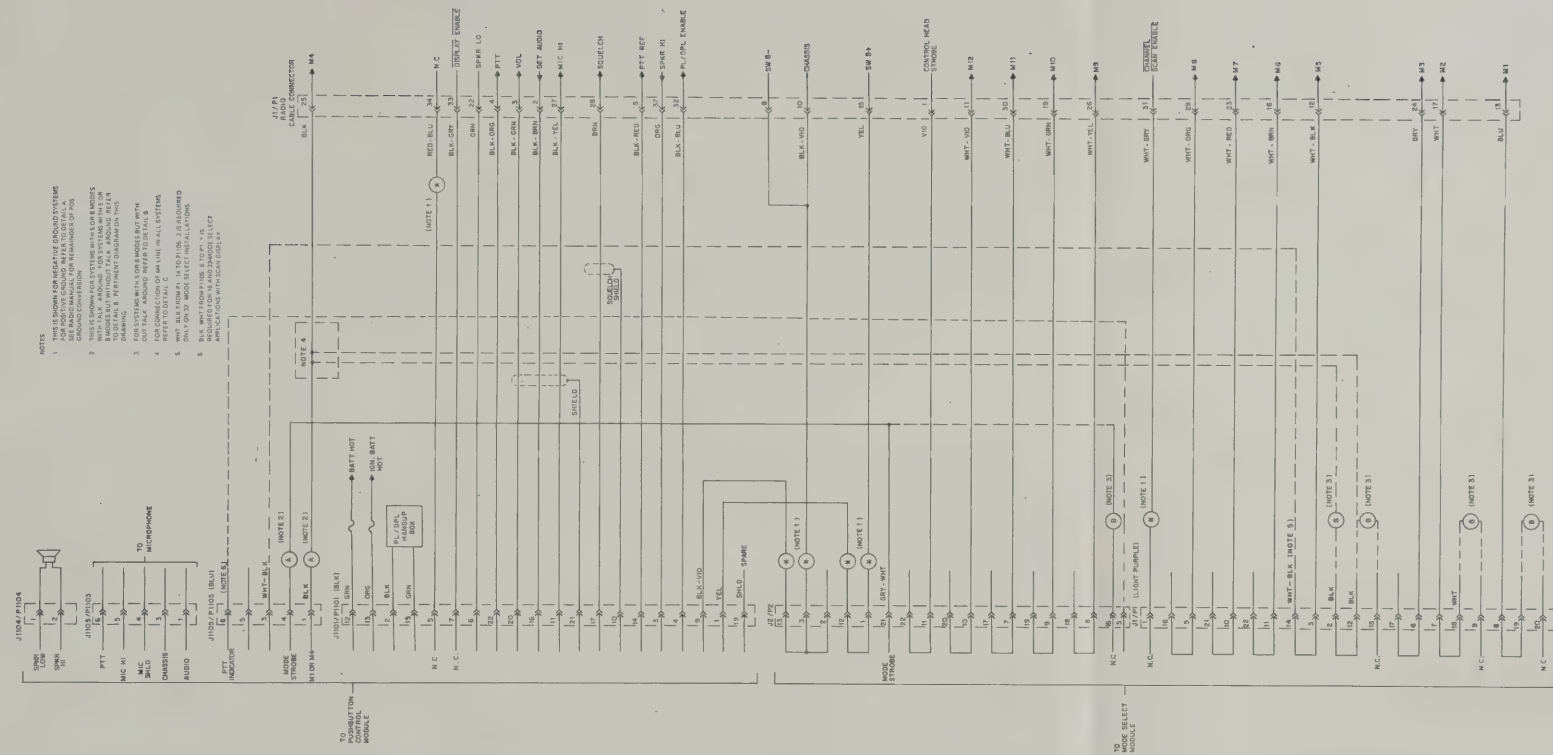
*HLN4296A/HLN4298A 16/32-Mode Pushbutton Control Module
Schematic Diagram, Circuit Board Detail,
Wiring Diagram, and Parts List
Motorola No. PEPS-33462-O
12/17/81- UP*

parts list

TRN4343A Mode Select Module		TRN4344A Mode Select Module		PL-7103-A
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION		
C1, 3, 4	21-11015A07	capacitor, fixed: uF +80-20%; 200 V unless otherwise stated		
C5, 6	23-84538G03	.01		
C7	21-11015A07	0.1 ± 20%; 35 V		
C8	23-11013E57	10 ± 20%; 25 V		
C9	21-11015A07	.01		
CR1	48-83954H01	diode: (see note)		
DS1 thru 5	65-84047E01	silicon		
DS6 thru 8	65-84047E01	lamp assembly:		
		14 V; 80 mA		
		14 V; 80 mA (TRN4344A only)		
E1 thru 7	76-83960B01	ferrite bead:		
		047 x .138 x .118"		
J1, 2	28-84269C01	connector:		
	28-84269C02	Includes:		
		CONTACT, low profile; 10 used		
		CONTACT, high profile; 10 used		
L1 thru 6	24-82723H01	coil, rf:		
		1.2 uH		
Q1, 2	48-869842	transistor: (see note)		
		NPN; type M9642		
R1 thru 8	6-11009A73	resistor, fixed: ± 5%; 1/4 W; unless otherwise stated		
R10 thru 18	6-11009E57	10k		
R19	6-11009E61	2.2k		
R21	6-11009E73	3.3k		
R22	6-11009E73	10k		
R23, 24	6-11009E73	2.2k		
R25	6-11009E81	3.3k		
R26	6-11009E81	2.2k		
R27	6-11009E73	10k		
R28	6-11009E81	3.3k (TRN4343A)		
	6-11009E49	1k (TRN4344A)		
R29	6-126C19	50 ± 10%; 1 W		
R30	6-125C29	150 ± 10%; 1/2 W		
R31	6-126C19	50 ± 10%; 1 W		
R32	6-125C29	150 ± 10%; 1/2 W		
R33	6-126C19	50 ± 10%; 1 W		
R34	6-125C29	150 ± 10%; 1/2 W		
R35	6-126C19	50 ± 10%; 1 W		
R36	6-125C29	150 ± 10%; 1/2 W		
R37	6-126C19	50 ± 10%; 1 W		
R38	6-125C29	150 ± 10%; 1/2 W		
R39	6-126C19	50 ± 10%; 1 W (TRN4344A)		
R40	6-125C29	150 ± 10%; 1/2 W (TRN4344A)		
R41	6-126C19	50 ± 10%; 1 W (TRN4344A)		
R42	6-125C29	150 ± 10%; 1/2 W (TRN4344A)		
R43	6-126C19	50 ± 10%; 1 W (TRN4344A)		
R44	6-125C29	150 ± 10%; 1/2 W (TRN4344A)		
R47 thru 59	6-11009E73	10k		
R60	6-126A35	270; 1 W		
S1 thru 5	40-84324C06	switch, pushbutton:		
S1 thru 8	40-84324C14	5-section (TRN4343A)		
		8-section (TRN4344A)		
U3	51-82884L78	integrated circuit: (see note)		
U4, 5	51-84561L78	8-bit priority encoder		
		hex inverter		
VR2	48-82256C51	voltage regulator:		
		Zener, 5.1 V		
non-referenced items				
1-80728D39	CIRCUIT BOARD ASSEMBLY includes U1 and J2 and:			
39-10184A10	CONTACT plug; 10 used			
1-80728D41	JUMPER ASSEMBLY, black includes:			
29-83167C01	TERMINAL STRAIN RELIEF			
37-82603D60	SLEEVE, number: blank			
39-10184A24	CONTACT receptacle			
1-80728D42	JUMPER ASSEMBLY, brown includes:			
29-83167C01	TERMINAL STRAIN RELIEF			
37-82603D60	SLEEVE, number: blank			
39-10184A24	CONTACT receptacle			
1-80728D43	JUMPER ASSEMBLY, red includes:			
29-83167C01	TERMINAL STRAIN RELIEF			
37-82603D60	SLEEVE, number: blank			
39-10184A24	CONTACT receptacle			
1-80728D44	JUMPER ASSEMBLY, orange includes:			
29-83167C01	TERMINAL STRAIN RELIEF			
37-82603D60	SLEEVE, number: blank			
39-10184A29	CONTACT fork			
1-80728D45	JUMPER ASSEMBLY, yellow includes:			
29-83167C01	TERMINAL STRAIN RELIEF			
37-82603D60	SLEEVE, number: blank			
39-10184A24	CONTACT receptacle			
14-84360C01	INSULATOR switch; 5 used (TRN4343A)			
14-84360C01	INSULATOR switch; 8 used (TRN4344A)			
37-82603D60	SLEEVE, number: blank; 8 used			

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

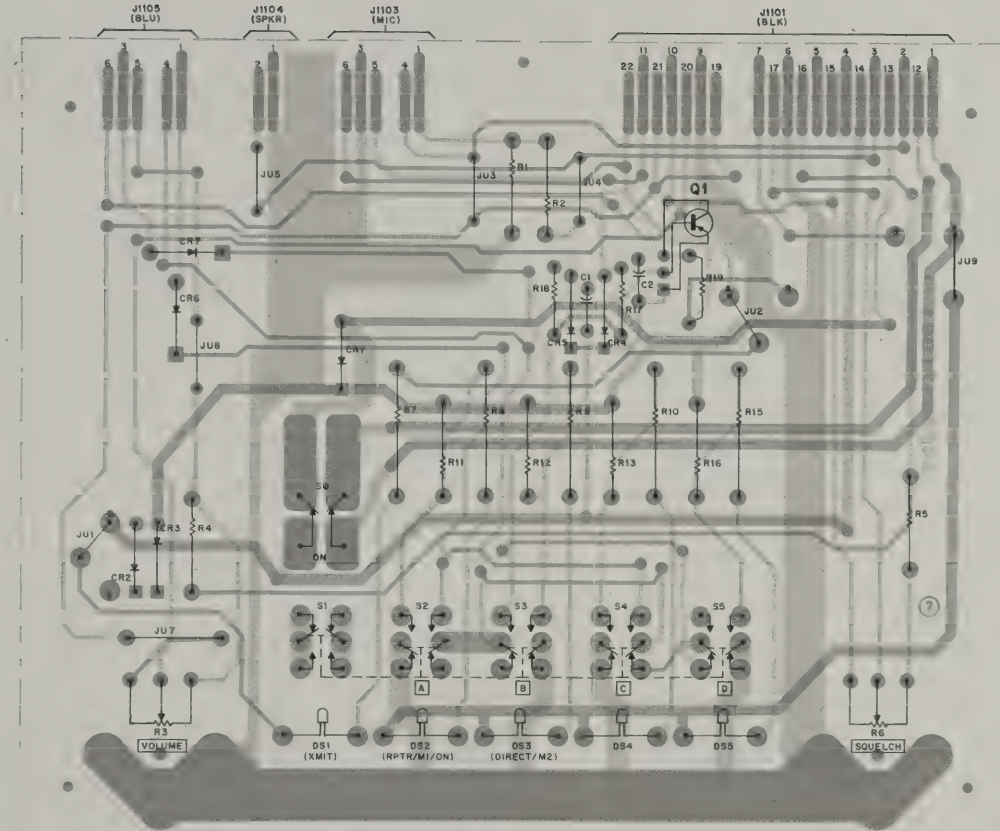
TRN4343A/TRN4344A Mode Select Module
Schematic Diagram, Circuit Board Detail,
Wiring Diagram, and Parts List
Motorola No. PEPS-30796-A
(Sheet 2 of 2)
12/17/81- UP



parts list

HLN4296A Pushbutton Control Module
 HLN4298A Pushbutton Control Module
 PL-7804-0

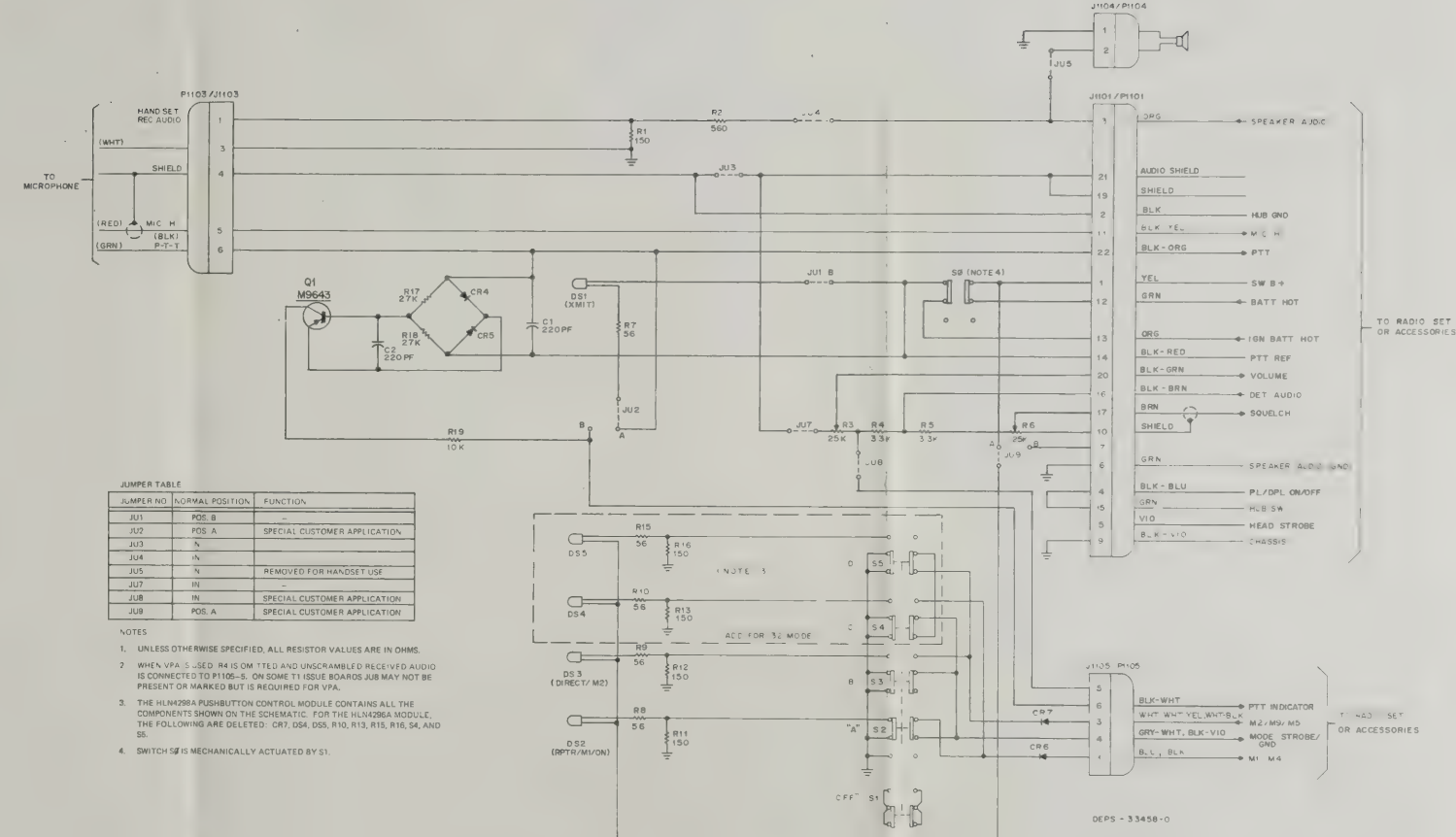
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1, C2	21-8396E10	capacitor, fixed: 220 pF, 500 V
DS1, 2, 3	65-84047E01	lamp assembly: 14 V, 80 mA
DS4, 5	65-84047E01	14 V, 80 mA (HLN4298A)
J1101	28-84269C01	connector:
	28-84269C02	Includes: CONTACT, low profile, 10 used
	28-84269C02	CONTACT, high profile, 10 used
J1103	28-84269C01	Includes: CONTACT, low profile, 3 used
	28-84269C02	CONTACT, high profile, 2 used
J1104	28-84269C01	Includes: CONTACT, low profile
	28-84269C02	CONTACT, high profile
J1105	28-84269C01	Includes: CONTACT, low profile, 3 used
	28-84269C02	CONTACT, high profile, 2 used
CR4, 5	48-83554H01	diode:
CR6	48-82392B03	silicon
CR7	48-82392B03	silicon (HLN4298A)
R1	6-125A29	resistor, fixed: $\pm 5\%$; 1/2 W;
R2	6-125A43	unless otherwise stated
R3	18-82238D23	150
R4, 5	6-125A51	560
R6	18-82238D23	variable, 25k
R7, 8	6-126C19	33k
R9	6-126C19	56 $\pm 10\%$; 1 W
R11	6-125C29	56 $\pm 10\%$; 1 W
R12	6-125C29	150 $\pm 10\%$
R10, 15	6-125C19	150 $\pm 10\%$ (HLN4298A)
R13, 16	6-125C29	150 $\pm 10\%$ (HLN4298A)
R17, 18	6-11009A83	27k $\pm 5\%$; 1/4 W
R19	6-11009A73	10k; 1/4 W
S1, 2, 3, 4, 5	40-84324C06	switch:
S0	40-84635C01	pushbutton, 5-position (HLN4298A)
S1, 2, 3	40-84324C39	slide: dpdt, momentary
	40-84324C39	pushbutton, 3-position (HLN4298A)
Q1	48-869643	transistor:
		NPN, type M9643
non-referenced items		
1-80728D43	JUMPER ASSEMBLY, red; 2 used	
29-80161C01	TERMINAL, STAIN-RELIEF	
37-82603060	SLEEVE, number: blank	
39-10184A24	CONTACT, receptacle	
2-10101A68	NUT, spring; 2 used	
35-84800C22	KNOB, variable resistor	
1-80760D36	CIRCUIT BOARD ASSEMBLY includes:	
39-10184A10	CONTACT, plug; 4 used	
14-84360C01	INSULATOR, switch; 3 used (TRN4340A)	
14-84360C07	INSULATOR, switch; 2 used (TRN4395A)	



NOTE:
 THE HLN4298A PUSHBUTTON CONTROL MODULE CONTAINS ALL THE COMPONENTS SHOWN ON BOARD FOR THE HLN4296A. THE FOLLOWING COMPONENTS ARE DELETED: CR7, DS4, DS5, R10, R13, R15, R16, S4, AND S5.

SHOWN FROM COMPONENT SIDE

COMPONENT SIDE 80-DEPS-33459-0
 SOLDER SIDE 80-DEPS-33460-0
 OL-DEPS-33461-0

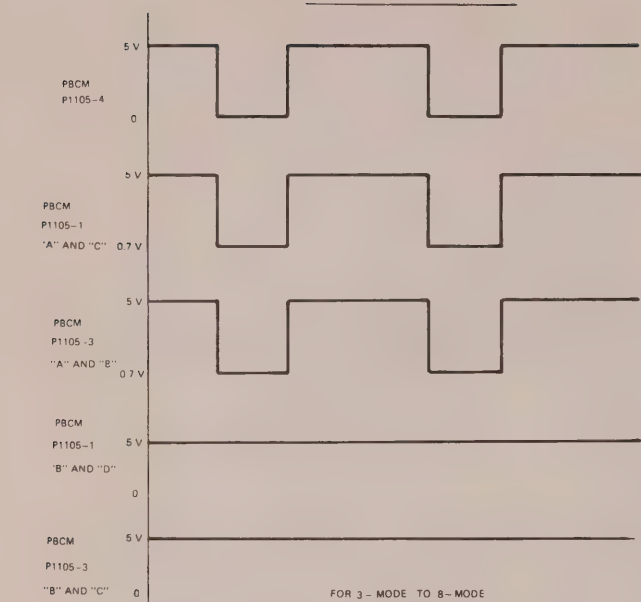


JUMPER NO.	NORMAL POSITION	FUNCTION
JU1	POS. B	-
JU2	POS. A	SPECIAL CUSTOMER APPLICATION
JU3	N	-
JU4	N	REMOVED FOR HANDSET USE
JU5	N	-
JU7	IN	-
JU8	IN	SPECIAL CUSTOMER APPLICATION
JU9	POS. A	SPECIAL CUSTOMER APPLICATION

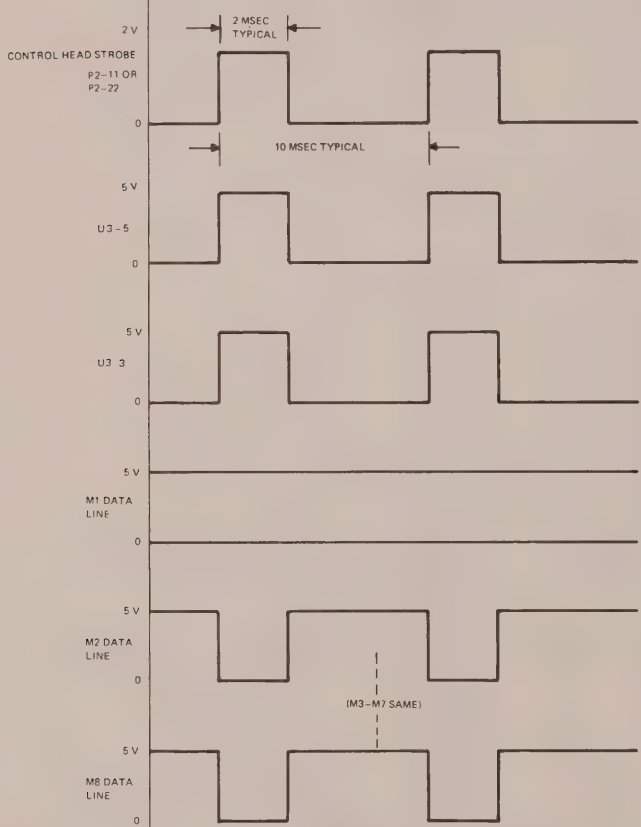
- NOTES
- UNLESS OTHERWISE SPECIFIED, ALL RESISTOR VALUES ARE IN OHMS.
 - WHEN VPA IS USED, R4 IS ON TIED AND UNSCANNED RECEIVED AUDIO IS CONNECTED TO P105-5. ON SOME T1 ISSUE BOARDS JUB MAY NOT BE PRESENT OR MARKED BUT IS REQUIRED FOR VPA.
 - THE HLN4298A PUSHBUTTON CONTROL MODULE CONTAINS ALL THE COMPONENTS SHOWN ON THE SCHEMATIC. FOR THE HLN4296A MODULE, THE FOLLOWING ARE DELETED: CR7, DS4, DS5, R10, R13, R15, R16, S4, AND S5.
 - SWITCH S5 IS MECHANICALLY ACTUATED BY S1.

HLN4296A/HLN4298A 16/32-Mode Pushbutton Control Module
 Schematic Diagram, Circuit Board Detail,
 Wiring Diagram, and Parts List
 Motorola No. PEPS-33462-0
 12/17/81-UP

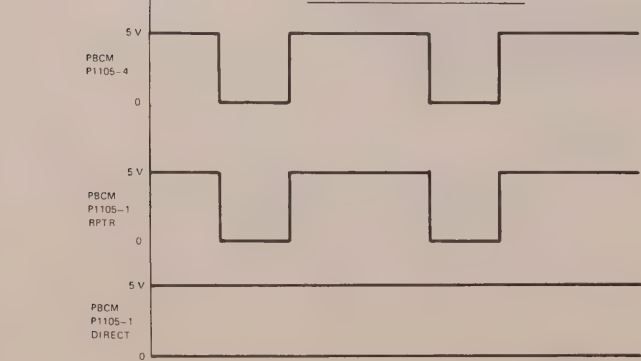
FOR 16/32 - MODE SYSTEMS



FOR 3 - MODE TO 8 - MODE SYSTEMS



FOR REPEATER/DIRECT SYSTEM



(DRAWING NOT TO SCALE)

SYNTRON X/SYSTEMS 90•S™
Pushbutton Control Head

68P81110E87-A